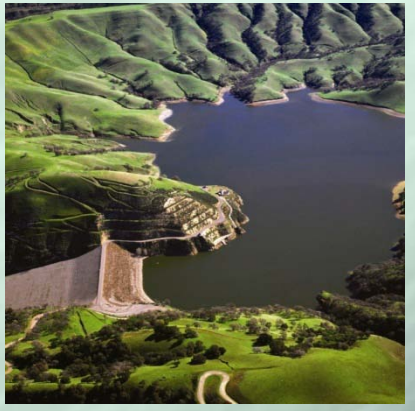


Quantifying Resource Management Strategy Benefits and Robustness

Rich Juricich,
California Department of Water Resources

Update 2013
California Water Plan

DWR Planning Studies

General Planning Studies
(high level, informational)

Project Level Studies
(detailed, decision documents)

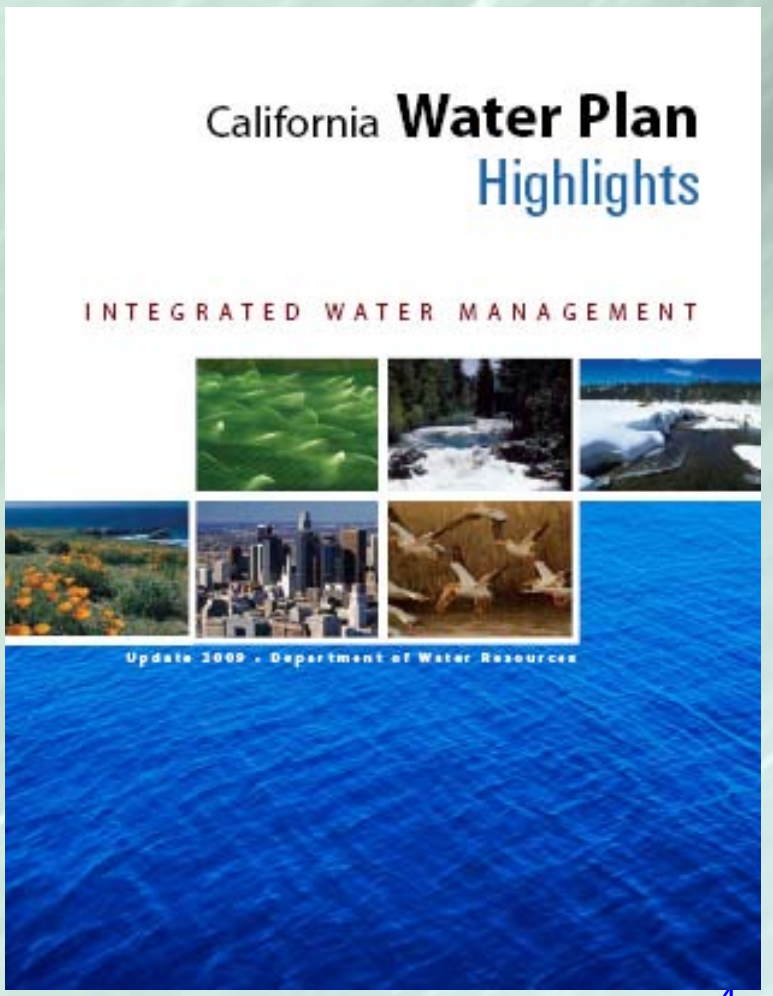
Presentation Overview

- Introduction to the California Water Plan
- Results from Update 2009
- Enhancements for Update 2013

Acknowledgements
- Dr. Mohammad Rayej, DWR
- Dr. Andy Draper, MWH
- Dr. David Purkey, Stockholm Environment Institute
- Dr. Brian Joyce, Stockholm Environment Institute
- Dr. David Groves, RAND Corporation
- Evan Bloom, RAND Corporation (Dr. in training)
- Dr. David Yates, National Center for Atmospheric Research
- Dr. Hal Cardwell, USACE, Institute for Water Resources

The California Water Plan Est. 1957

- First published in 1957
- Updated 9 times; last one in 2009
- DWR required by law (Water Code) to update the Water Plan every 5 years; next one in 2013
- Growing interest by Legislature and stakeholders
- Not a mandate & No appropriation



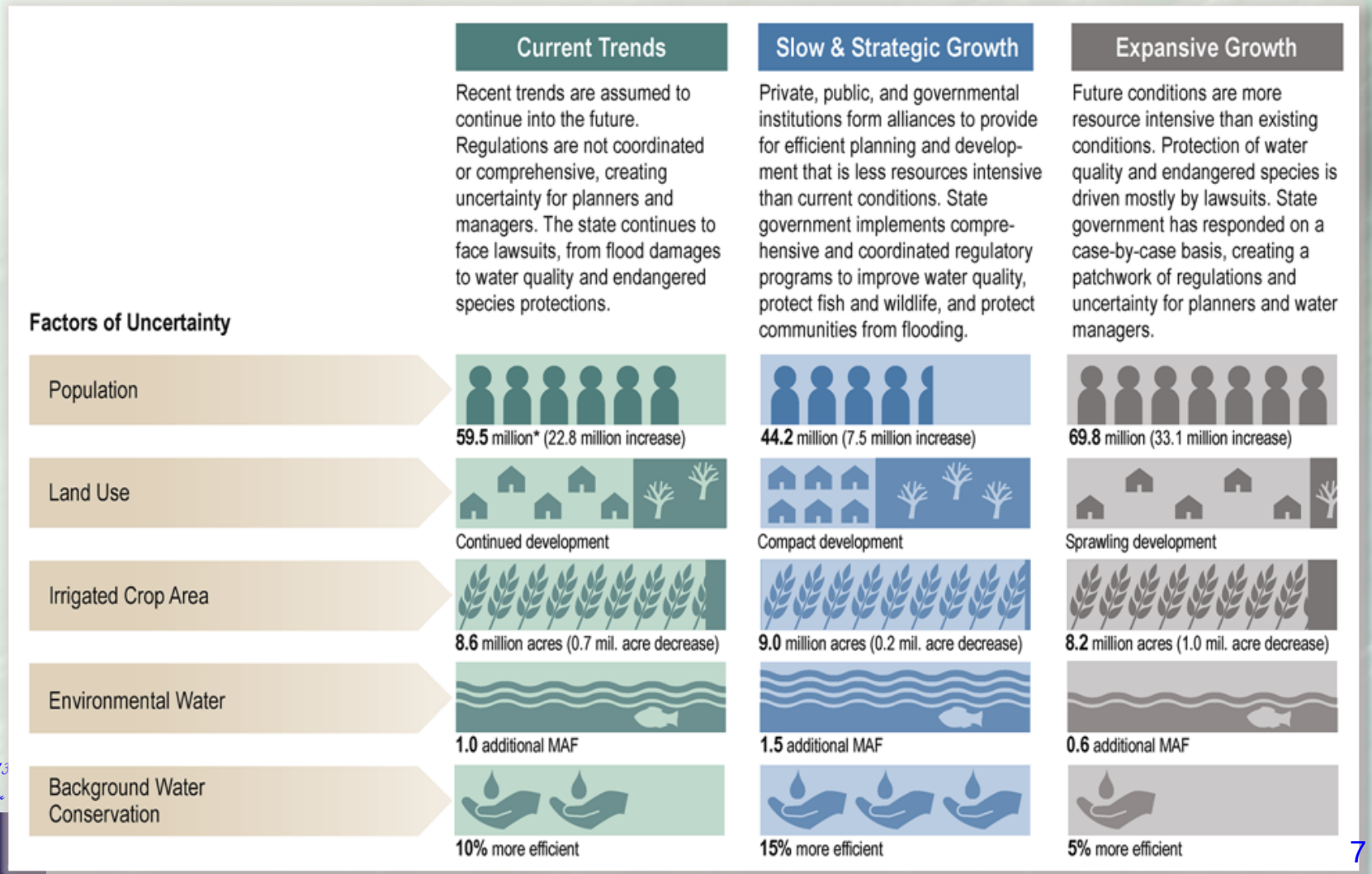
California Water Plan

State's Blueprint for
Integrated Water Management & Sustainability

Managing an Uncertain Future

Risk, Uncertainty, and Sustainability

Update 2009 Scenarios



Analysis Considers Possible Climate Change Impacts

- **Global circulation models produce numerous projections of fut**
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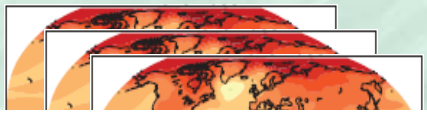
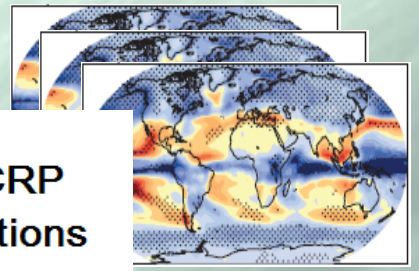
Future Temperature Projections



Future Precipitation Projections



RECLAMATION USGS

Santa Clara University CLIMATE CENTRAL

SCRIPPS INSTITUTION OF OCEANOGRAPHY

Bias Corrected and Downscaled WCRP CMIP3 Climate and Hydrology Projections

This site is best viewed with Chrome (recommended) or Firefox. Some features are unavailable when using Internet Explorer. Requires JavaScript to be enabled.

Welcome | About | Tutorials | Projections: Subset Request | Projections: Complete Archives | Feedback | Links

Summary

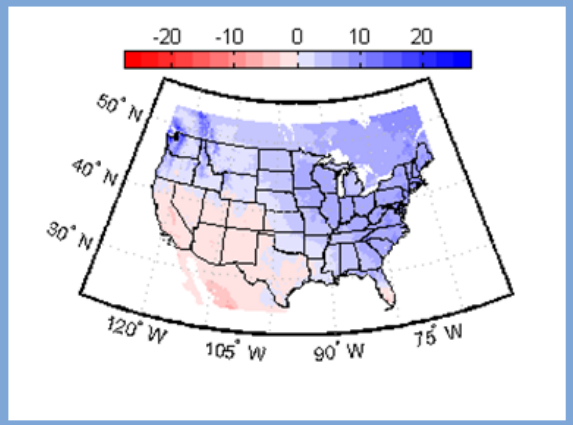
This archive contains fine spatial-resolution translations of:

- climate projections over the contiguous United States (U.S.) developed using two downscaling techniques (monthly BCSD Figure 1, and daily BCCA Figure 2), and
- hydrologic projections over the western U.S. (roughly the western U.S. Figure 3) corresponding to the monthly BCSD climate projections.

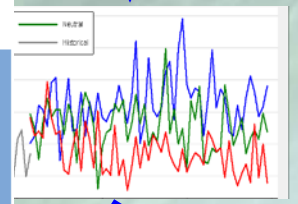
Archive content is based on global climate projections from the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset, which was referenced in the Intergovernmental Panel on Climate Change Fourth Assessment Report. Please see the "About" page for information on projection development, including the methodology to perform climate model bias-correction and spatial downscaling.

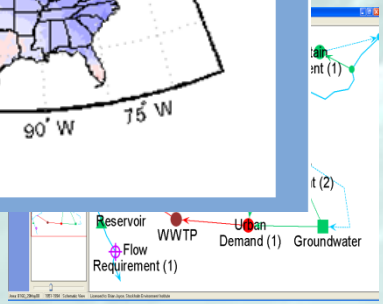
Purpose

Figure 1: BCSD CMIP3 Monthly Climate Analysis example - Median projected change in average-annual precipitation (cm/year), 2041-70 versus 1971-2000.



weather

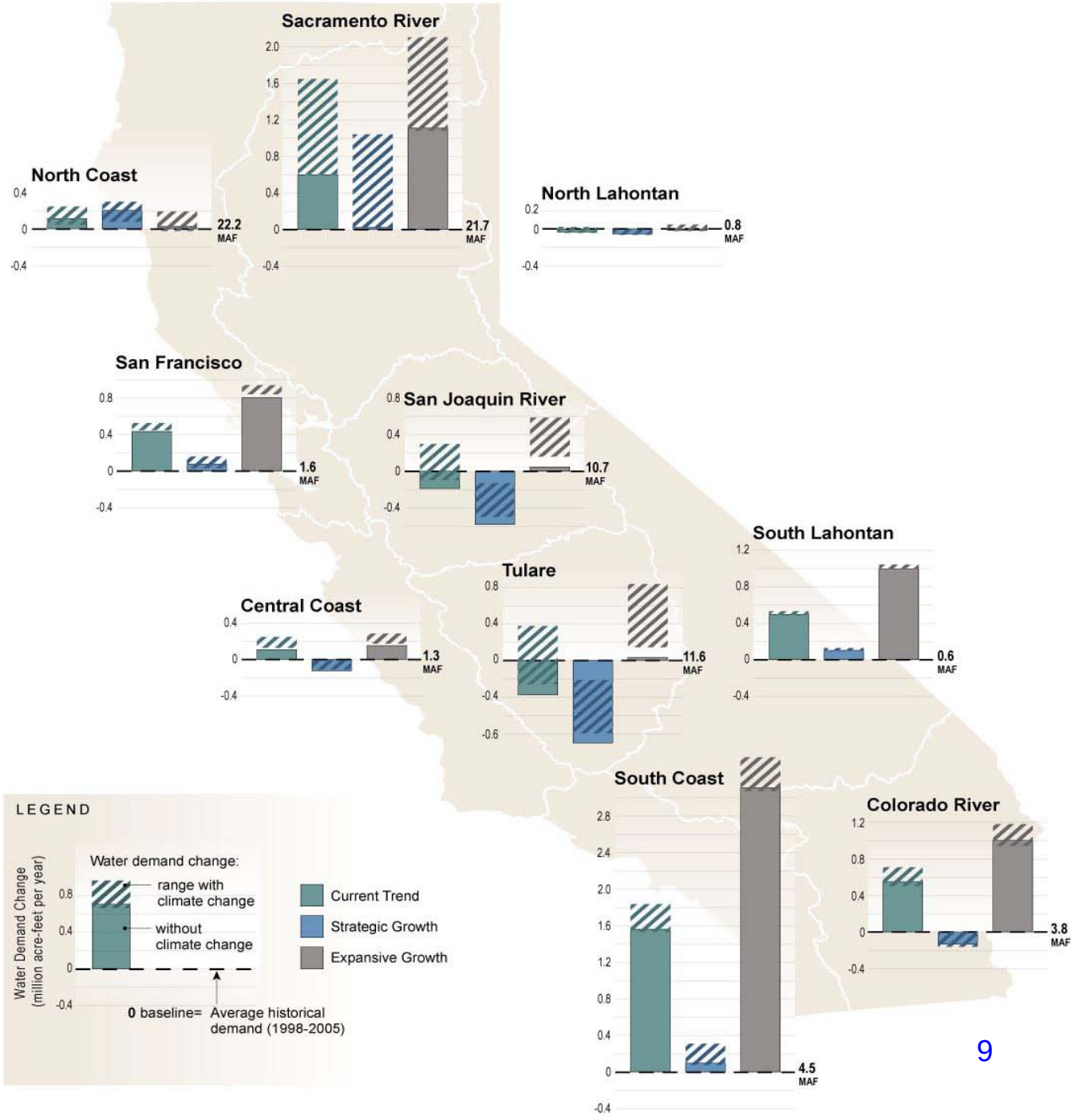




Hydrologic Model

*** Using the World Climate Research Programme's (WCRP's) Coupled Model Intercomparison Project phase 3 (CMIP3) multi-model dataset**

Update 2009 Regional Water Demand Changes By Scenario



Resource Management Strategies (Update 2009)
A Range of Choices

Reduce Water Demand
- Agricultural Water Use Efficiency
- Urban Water Use Efficiency

Improve Operational Efficiency & Transfers
- Conveyance – Delta
- Conveyance – Regional / Local
- System Reoperation
- Water Transfers

Increase Water Supply
- Conjunctive Management & Groundwater Storage
- Desalination –Brackish & Seawater
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage – CALFED
- Surface Storage – Regional / Local

Improve Flood Management
- Flood Risk Management

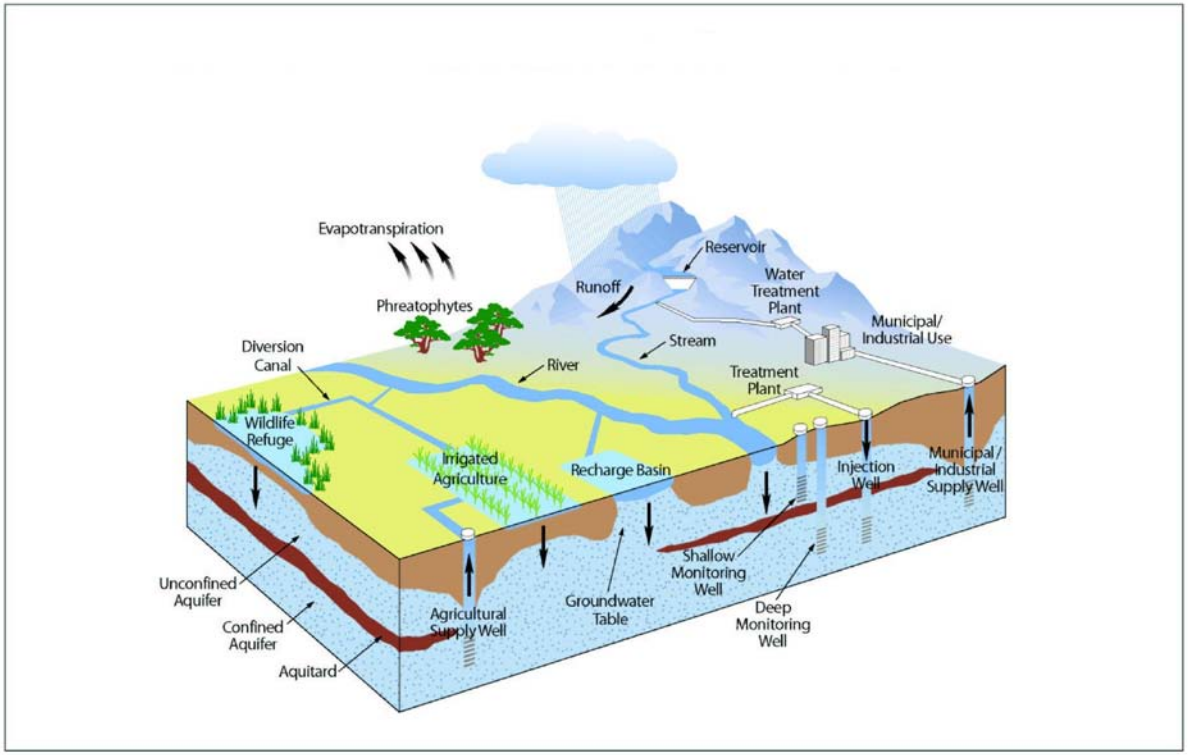
Improve Water Quality
- Drinking Water Treatment & Distribution
- Groundwater / Aquifer Remediation
- Matching Quality to Use
- Pollution Prevention
- Salt & Salinity Management
- Urban Runoff Management

Practice Resource Stewardship
- Agricultural Lands Stewardship
- Economic Incentives (Loans, Grants & Water Pricing)
- Ecosystem Restoration
- Forest Management
- Land Use Planning & Management
- Recharge Areas Protection
- Water-Dependent Recreation
- Watershed Management

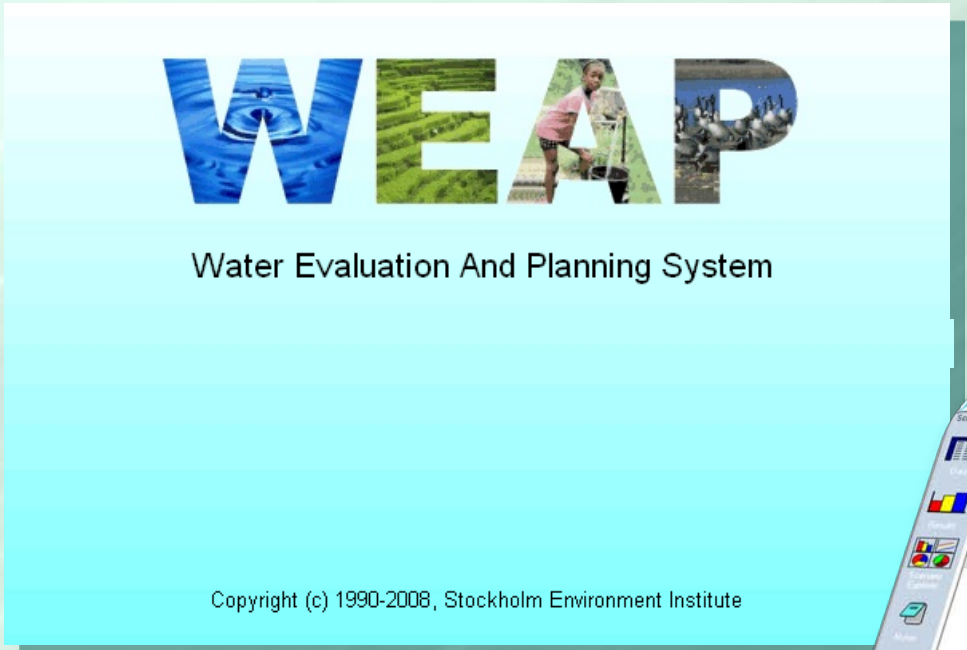
Other-- Crop idling, dew vaporization, fog collection, irrigated land retirement, rainfed agriculture, waterbag transport

Improvements to analytical tools allow fo more comprehensive evaluation

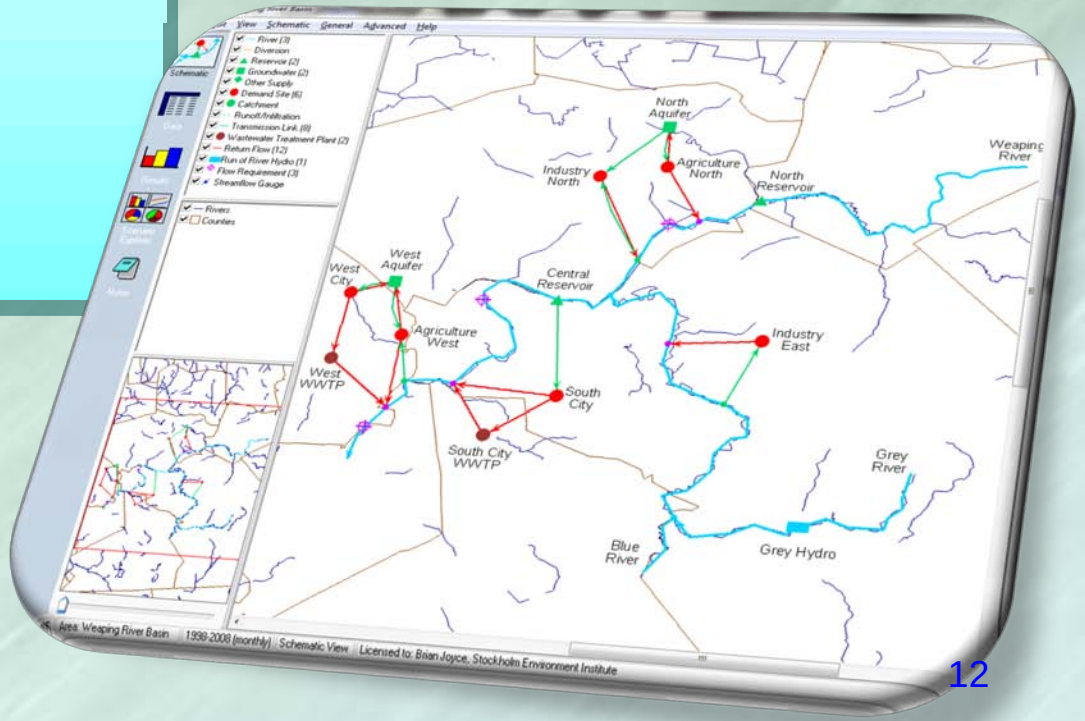
- Introduction to the California Water Plan
- Update 2009 Results
- Enhancements for Update 2013



Water Evaluation And Planning System

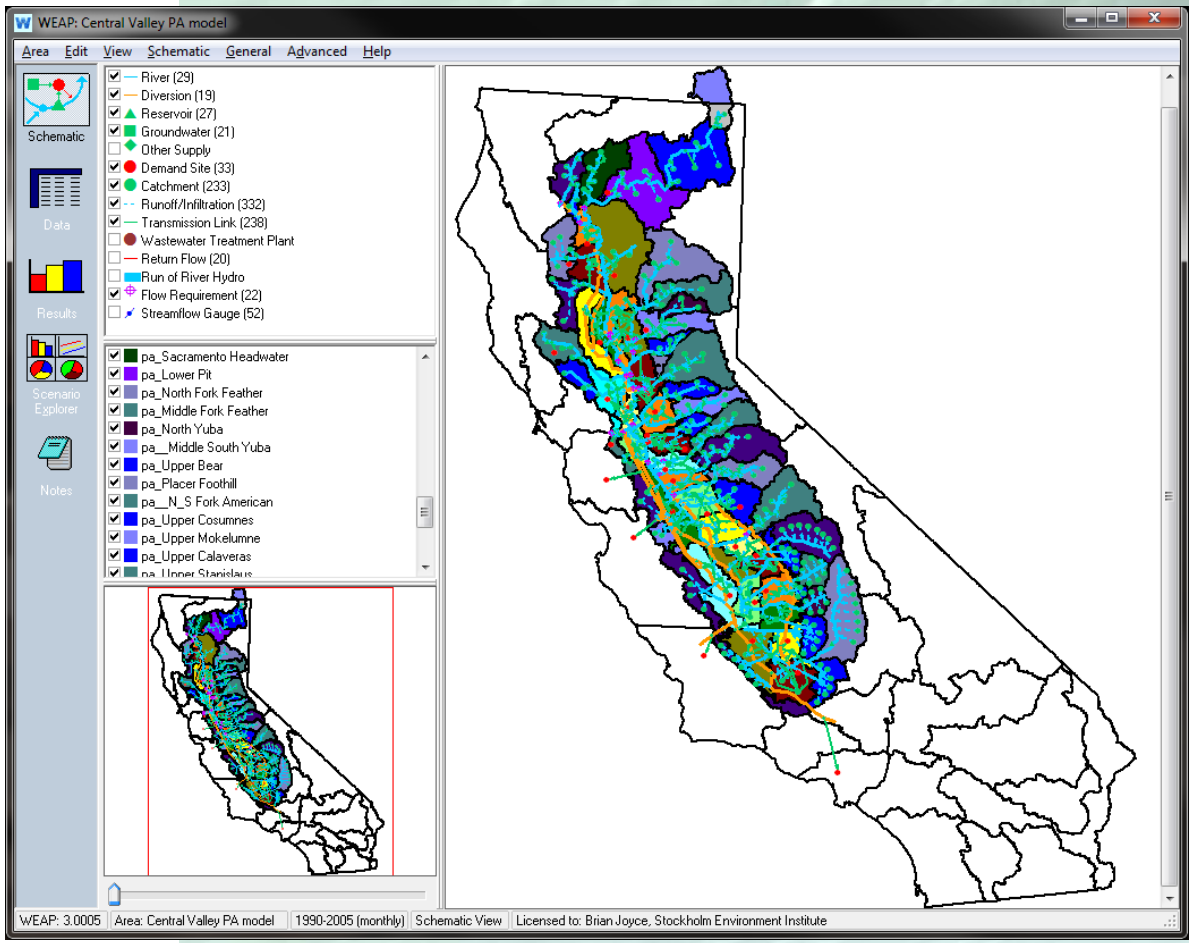


Generic, object-oriented, programmable, integrated water resources management modeling platform



Update 2013 California Water Plan

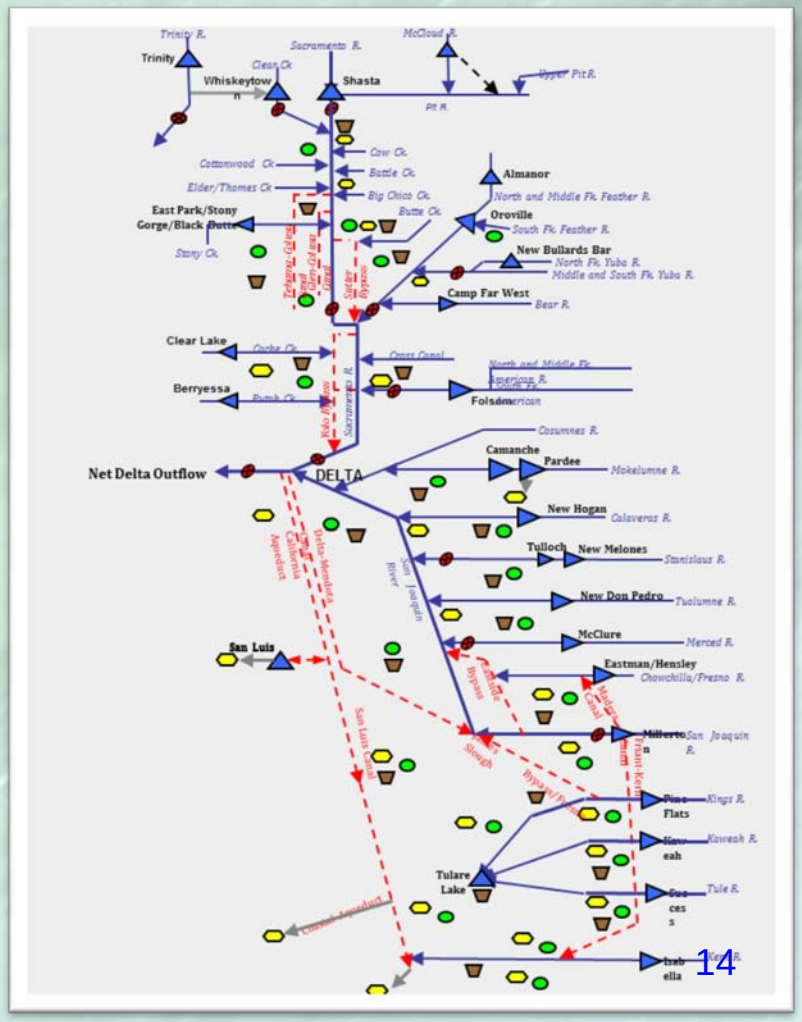
Central Valley WEAP Model



Water Evaluation And Planning (WEAP) Model*

Integrates Hydrology and Water Management

- Monthly temperature and precip. drive rainfall/runoff model
- Indoor demands:
  - Households / employees
- Irrigation demands:
  - monthly climate
  - land use patterns
- Network of rivers, reservoirs, conveyance, groundwater basins
- Linear program routes supplies to demand nodes according to supply preferences and priorities



Update 2013
California Water Plan

*http://www.weap21.org/

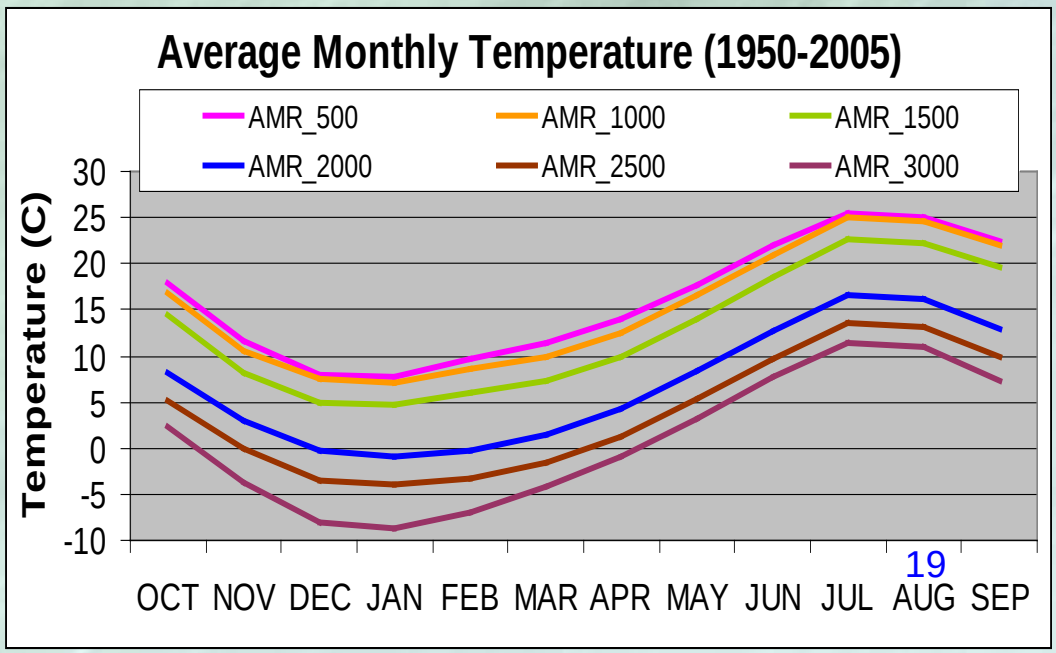
Gridded Climate Data

- 2,905 California grid points for climate data
- Central Valley WEAP PA model uses 233 representative points from 1,045 points covering source watershed and demand areas

Elevation Banding of Source Watersheds

Ex. American River:

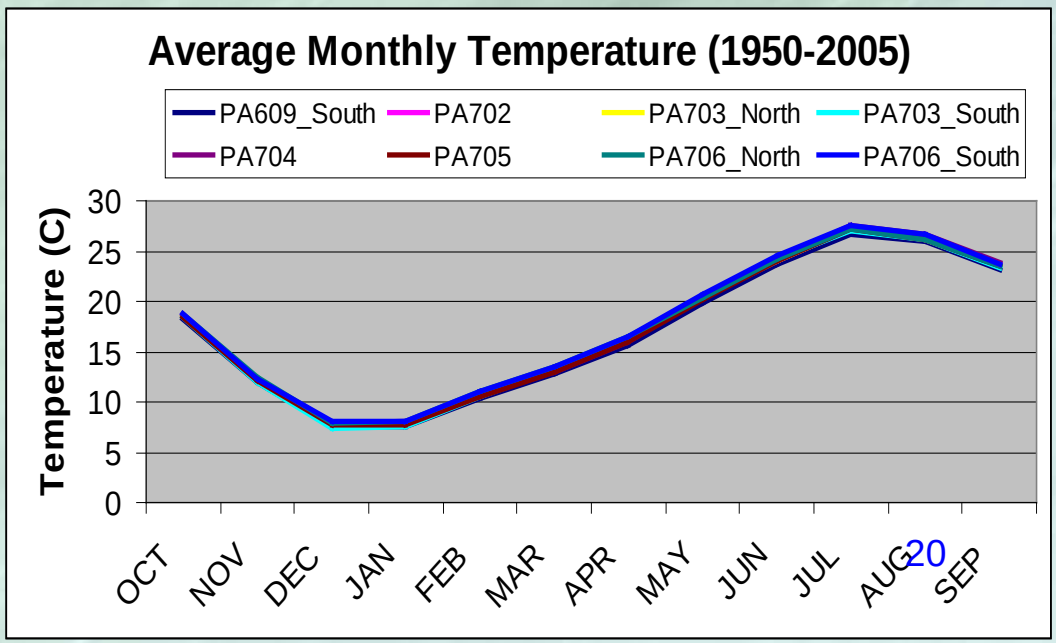
- Six 500-meter elevation bands
- 6 points selected from 33 grid points



Valley Floor Demand Areas

Ex. Southern San Joaquin Valley (PA's 609, 702, 703, 704, 705, 706):

- 8 points selected from 104 grid points



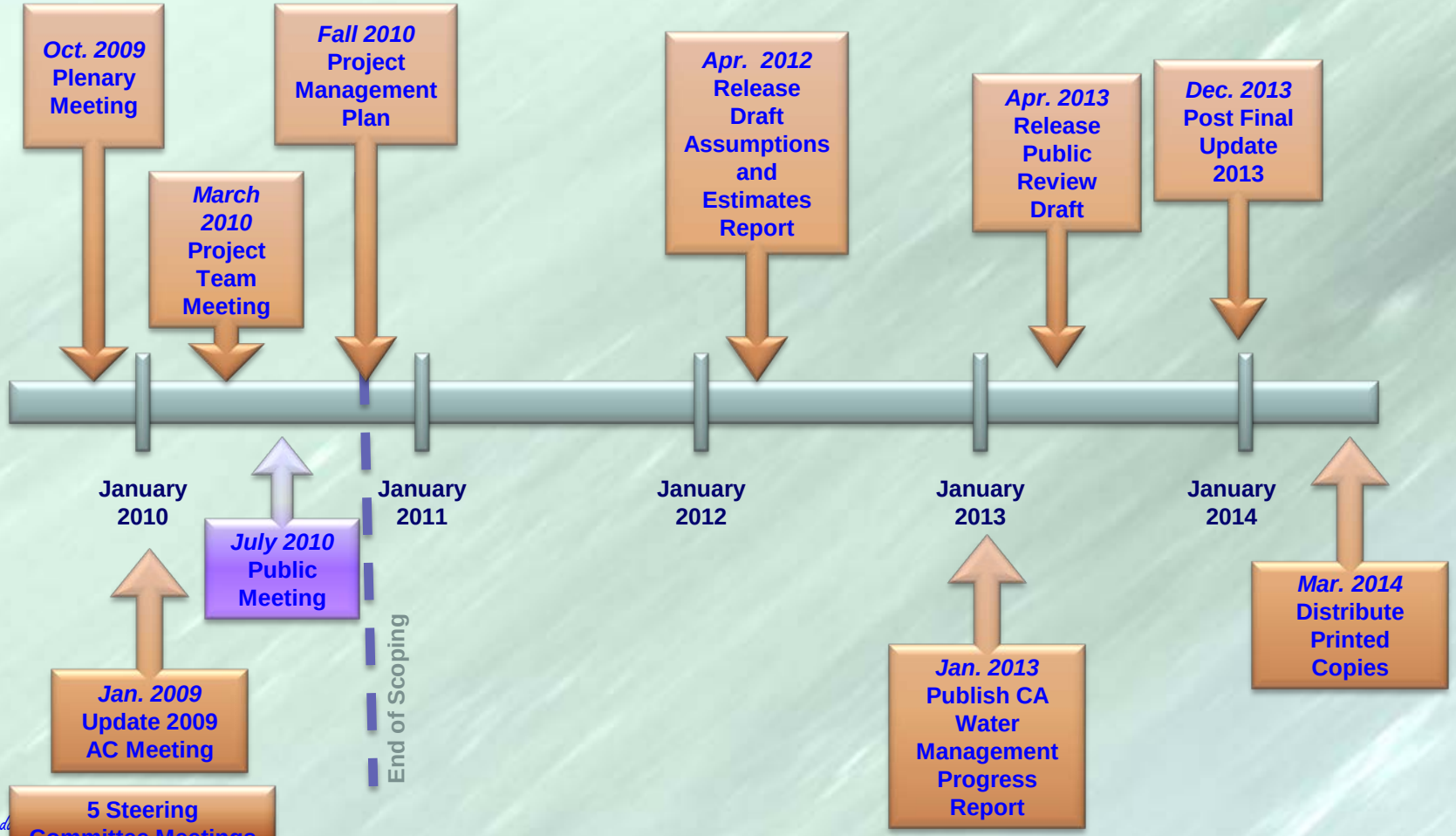
Limitations for Update 2013 Analysis

- Resource limitations restrict more comprehensive analysis three regions in Central Valley
  - Phased approach
- Cannot represent all strategie or quantify all strategy benefit
- Representation of regional groundwater and surface wat systems
- Use monthly rainfall-runoff, water use, and water system operations data

Areas Outside of Sacramento River, San Joaquin River and Tulare Lake Regions

- Apply simpler Hydrologic Region model developed for Update 2009
- Quantify regional water demand
  - Update 3 growth scenarios
  - Update 12 climate scenarios
- Ability to include some demand management strategies

Water Plan Update 2013
Timeline and Major Deliverables



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